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Observations on two rarely collected species of *Russula*

P. Manimohan & K. P. Deepna Latha

Department of Botany, University of Calicut, Kerala, 673 635, India
Correspondence to: *pmanimohan@gmail.com & deepnalathakp@gmail.com*

Abstract — *Russula periglypta* and *R. purpureonigra,* originally reported from Sri Lanka several decades back, were collected from Kerala State, India. Full descriptions and photo-illustrations of these rediscovered species are provided along with some taxonomic observations.

Key words — *Basidiomycota, Russulales, Russulaceae,* taxonomy, floristics

Introduction

During our investigations on the agaric mycota of Kerala State, India, we came across two rarely collected species of the genus *Russula* (*Basidiomycota, Russulales, Russulaceae*), viz. *R. periglypta* and *R. purpureonigra,* originally reported from Sri Lanka almost a century or more back. As we had the opportunity to collect and study them on several occasions, we thought it prudent to provide full descriptions and photo-illustrations of these rediscovered species along with our taxonomic observations.

Materials & methods

Conventional morphology-based taxonomic methods were employed for this study. Chemical spot tests were made on stipe surface with ferrous sulfate, aniline and aqueous phenol. Microscopic observations were made on material stained with 1% aqueous solutions of phloxine and Congo red and mounted in 3% aqueous KOH. Melzer's reagent was used to observe whether the spores and tissues were amyloid. Reactions of the macrocystidial contents to sulfovanillin were noted. For evaluation of the range of spore-size, 20 basidiospores each from one specimen of each collection cited were measured. Colour codes used in the descriptions are from Kornerup & Wanscher (1978). The examined collections cited are deposited at the Kew (Mycology) Herbarium and the Kew accession numbers (e.g., K(M) 165811) are indicated. The infrageneric classification followed is that of Sarnari (1998).

Taxonomy

Russula periglypta Berk. & Broome, Journ. Linn. Soc., Bot. 11: 566 (1871). Fig. 1

> Original diagnosis: "Pileus 2½ inches across, hemispherical, viscid, margin regularly and strongly sulcate; stem nearly 3 inches high, ¾ thick in the middle, attenuated at the base, somewhat swollen in the centre, solid; gills regular, arched, ¼ inch wide, acute behind, reaching to the top of stem; interstices reticulate. Very regular in form. Spores globose, echinulate, .00025 in diameter."

Basidiomata medium-sized to somewhat large. Pileus 25–90 mm diam., initially convexo-hemispherical with a slightly depressed centre, then applanate with a depressed centre and finally almost infundibuliform; surface initially pale yellow (4A2, 4A3), later greyish brown (5B2, 5D2, 5E2), slightly viscid, initially smooth and pellucid-striate towards margin, becoming tuberculate-striate and sulcate up to half the way from margin with age; margin initially slightly incurved and entire, becoming straight or almost upturned and fissile. Lamellae adnexed to adnate, whitish or marble white (5A2), close to almost crowded, up to 10 mm broad, rarely furcate, with occasional lamellulae, with abundant interveining; edge entire, concolorous with the sides. Stipe 25–90 × 6–22 mm, central, terete, mostly tapering towards base, occasionally tapering towards both ends, stuffed or hollow; surface whitish or marble white (5A2), glabrous. Odour mild, spicy. Spore-print whitish. Chemical spot tests on stipe surface: $FeSO_4$: no reaction in the beginning, slowly turning pinkish brown; aniline: no reaction; aqueous phenol: chocolate brown.

Basidiospores 5–8 × 4–7.5 µm, Q = 1–1.5, QM = 1.2, globose, subglobose or ovo-ellipsoid, thin-walled, hyaline, strongly amyloid, with 1–3 µm long spinose projections and connectives forming a partial reticulum. Basidia 22–60 × 4–16 µm, clavate, thin-walled, hyaline, 4-spored; sterigmata up to 7.5 µm long. Lamella-edge heteromorphous, with scattered macrocystidia. Macrocystidia 22–70 × 3–14 µm, sinuoso-fusoid, with an apex that is either mucronate or capitate, or with a moniliform appendage, hyaline, thin-walled, projecting up to 22 µm beyond the level of tips of basidia, with amorphous contents, not staining with sulfovanillin. Lamellar trama irregular; hyphae 2–12.5 µm wide, hyaline, thin-walled, intermixed with groups of sphaerocytes, 8–35 × 7.5–32 µm, inamyloid. Subhymenium poorly developed. Pileus trama interwoven; hyphae 2–8 µm wide, hyaline, thin-walled, intermixed with numerous sphaerocytes, 11–40 × 11–40 µm, inamyloid. Pileipellis an ixocutis tending to form an ixotrichodermium at places; hyphae 2–8 µm wide, loosely arranged, suspended in a gelatinized matrix, devoid of encrustations; pileocystidia scattered or not seen in some collections, 30–70 × 2–6 µm, sinuoso-fusoid, with an apex that is either mucronate or capitate, or with a moniliform appendage, hyaline, thin-walled, not staining with sulfovanillin. Stipitipellis a cutis; hyphae 2–6.5 µm wide, hyaline, thin- walled, inamyloid,

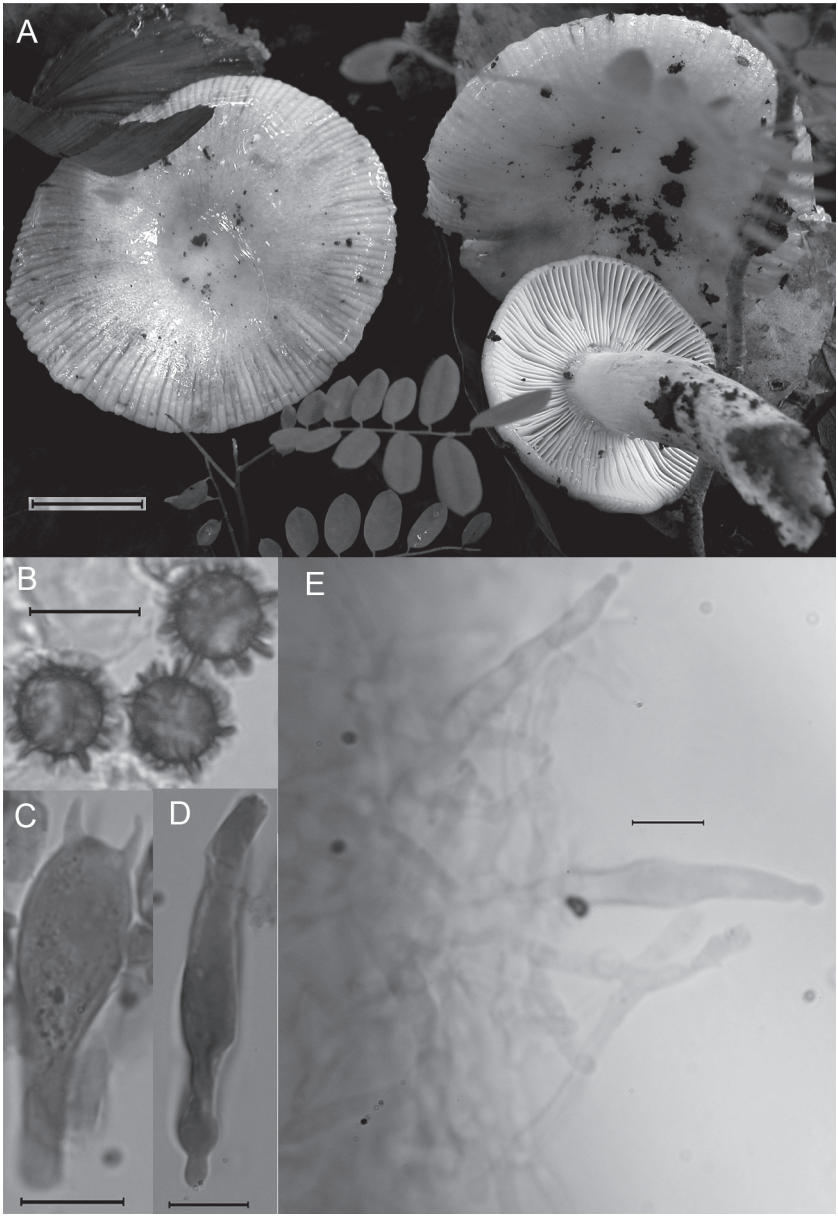

Figure 1: *Russula periglypta*. A, basidiomata; B, basidiospores; C, basidium; D, macrocystidium; E, pileipellis. Scale bars, 10 mm for basidiomata; 10 µm for microstructures.

devoid of encrustations; caulocystidia absent. Clamp-connections not observed on any hyphae.

Habitat: On the ground, scattered in the proximity of a *Vatica chinensis* (*Dipterocarpaceae*) tree.

Specimens examined: **INDIA. Kerala state**, Malappuram District, Calicut University Campus, Botanical Garden: 29 June 1994, P. Manimohan M599a (K(M)165817); 5 July 1994, P. Manimohan M599b (K(M)165818); 12 July 1995, P. Manimohan M599c (K(M)165819); 30 June 1997, P. Manimohan M685a (K(M)165815); 01 July 1997, P. Manimohan M685b (K(M)165816). **SRI LANKA. Central Province**, Kandy District, Peradeniya, Nov. 1868, Thwaites 800 cum icon (K(M)165414, holotype).

Discussion: *Russula periglypta* was first described by Berkeley & Broome (1871) with a very scanty description based on material (Thwaites 800, K) collected in Peradeniya in 1868. Petch (1910) gave a better macroscopic description of the species, presumably based on his own field observations. Patouillard (1913) recorded it from Vietnam. Pegler (1986) provided a modern description of the species based on his examination of the type material now preserved in Kew Herbarium.

Our examination of the Kerala collections and the type material revealed that they were conspecific. The pale yellow, slightly viscid pileus that becomes tuberculate-striate and sulcate up to half the way from margin with age is a diagnostic field character of this species. The shape of the basidiospores and the length of the spinose projections showed considerable variations amongst the five Kerala collections studied. The range of Q value was 1–1.5 and the range of length of the spinose projections was 1–3 µm. Similarly, the presence of pileocystidia is another variable character, as we could not see them in some collections. We are of the opinion that this variability in the basidiospore morphology and distribution of pileocystidia should be considered during microscopic identification of this species. Also, unlike Pegler (1986), we observed scattered macrocystidia on both edges and sides of lamellae, and they projected up to 22 µm beyond the level of tips of basidia.

Russula periglypta belongs to subgen. *Ingratula* Romagn. sect. *Ingratae* (Quél.) Maire subsect. *Foetentinae* (Melzer & Zvára) Singer.

Russula purpureonigra Petch, Ann. Roy. Bot. Gard., Peradeniya 6: 200 (1917) Fig. 2

Original diagnosis: "Whole fungus at first white, then blackish-gray, finally purple-black. Pileus up to 15 cm. diameter, infundibuliform, glabrous, with a viscid separable cuticle. Flesh thick, at first white, becoming black when cut. Stalk up to 6 cm. high, 2.5 cm. diameter, minutely pruinose, equal, solid. Gills crowded, narrow, attenuated outwards, adnate or adnato-decurrent. Spores white, globose, nodular, 5-7 µ diameter."

Basidiomata medium-sized to large, fleshy, brittle, all parts blackening on bruising or on drying. Pileus 30–120 mm diam., initially convex with a slightly depressed centre, becoming deeply infundibuliform; surface greyish

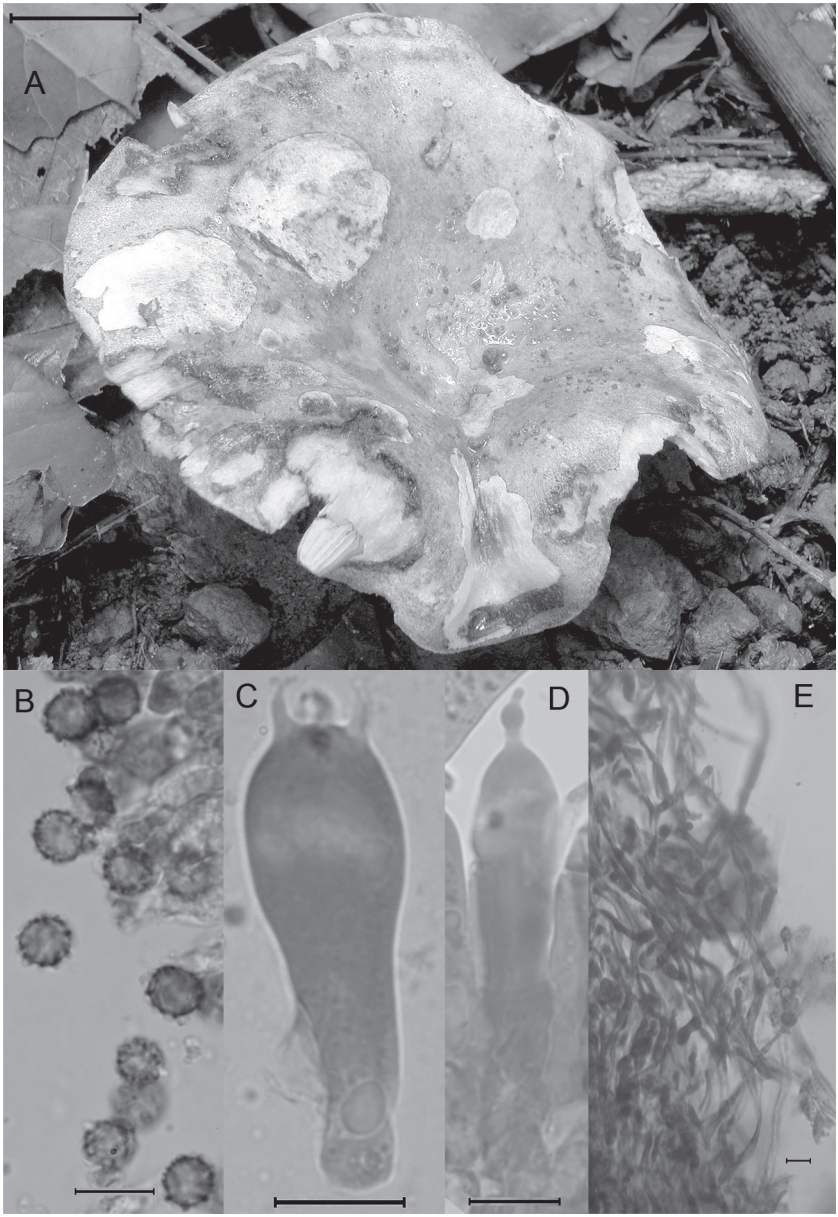

Figure 2: *Russula purpureonigra*. A, basidioma; B, basidiospores; C, basidium; D, macrocystidium; E, pileipellis. Scale bars, 10 mm for basidioma; 10 µm for microstructures.

with pale pinkish or pale brown tints (5B2, 5C2, 6B2, 6C2), slightly sticky or somewhat viscid, not striate, smooth and glabrous; margin initially distinctly incurved to slightly inrolled, becoming straight and finally upturned, initially entire, becoming lobate and fissile. Lamellae subdecurrent to decurrent, off-white to cream-coloured (4A2), crowded, with lamellulae of several lengths, up to 4 mm wide; edge entire, concolorous with the sides. Stipe 20–50 × 7–20 mm, central, terete, tapering towards base, stuffed; surface off-white or cream-coloured (4A2), glabrous. Odour and taste not distinctive. Spore-print white. Macrochemical spot tests on stipe surface: $FeSO_4$: bluish green; aniline: chocolate brown; aqueous phenol: chocolate brown.

Basidiospores 4.5–7 × 4.5–6.5 µm, Q = 1–1.33, QM = 1.1, globose to subglobose or rarely ovo-ellipsoid, thin-walled, hyaline, with amyloid, spinose projections up to 0.25 µm long and connectives forming a partial reticulum. Basidia 22–42.5 × 5–11.5 µm, clavate, thin-walled, hyaline, 4-spored; sterigmata up to 6.5 µm long. Lamella-edge heteromorphous, with crowded macrocystidia. Macrocystidia 40–85 × 3.5–9 µm, sinuoso-cylindric or clavato-mucronate, thin-walled, with brownish contents, not reacting with sulfovanillin, present both on the edge and sides of lamellae. Lamellar trama interwoven; hyphae 2–6.5 µm wide, thin-walled, hyaline, inamyloid, intermingled with clusters of sphaerocytes, 16–56 × 11–39 µm, thin-walled, hyaline, inamyloid. Pileus trama interwoven; hyphae 3–7 µm broad, thin-walled, hyaline, inamyloid, intermingled with clusters of sphaerocytes, 11–57 × 10–49 µm, thin-walled, hyaline, inamyloid. Pileipellis an ixocutis composed of gelatinised hyphae; hyphae 2–10 µm broad, thin-walled, hyaline, devoid of encrustations; pileocystidia absent. Stipitipellis a cutis; hyphae 1.5–6.5 µm broad, thin-walled, hyaline, devoid of encrustations; caulocystidia absent. Clamp-connections absent.

Habitat: On the ground, scattered in the proximity of a *Vatica chinensis* tree.

Specimens examined: **INDIA**. **Kerala state**, Malappuram District, Calicut University Campus, Botanical Garden: 25 August 1993, P. Manimohan M572b (K(M)165811); 22 July 1994, P. Manimohan M572c (K(M)165812); 24 June 1994, P. Manimohan M572d (K(M)165813); 25 June 1997, P. Manimohan M572e (K(M)165814). **SRI LANKA**. **Central Province**, Kandy District, Peradeniya, July 1912, Petch 3498 (K(M)165416); 15 Oct. 1914, Petch 4493 (K(M)165417).

Discussion: *Russula purpureonigra* was originally published without any microscopic characters except those of the basidiospores (Petch 1917) and the type collection of the species (Petch 4175) remains untraceable. A modern description of this species provided by Pegler (1986) is based on two authentic Kew collections (Petch 3498 (KM 165416) and Petch 4493 (KM 165417)). We examined both collections and found them to be heavily mold-infested but still retaining all microscopic features including basidiospores. We agree with

Pegler's (1986) observations on most characters. However, according to Pegler (1986), the basidiospores of the Sri Lankan material measured 7–10 × 6–7.5 µm. We found the basidiospores to be smaller in them (5.5–8 × 4.5–6.5 µm in Petch 3498 and 4.5–6 × 4–5.5 µm in Petch 4493). Remarkably, the present Indian collections also have spores with a similar size range (4.5–7 × 4.5–6.5 µm). Petch (1917) in his original description of the species also recorded that the spores were 5–7 µm in diam. Singer (1955) also measured the spores of the Kew material as 7 × 5.8 µm. While Pegler (1986) observed macrocystidia only on the edges of the lamellae, we found them scattered on both lamellar edges and sides.

As noted by both Singer (1955) and Pegler (1986), *R. purpureonigra* is a good representative of the section *Compactae* Fr. (= *Nigricantes* Maire, *Nigricantinae* Bataille) of subgenus *Compacta* (Fr.) Bon owing to its smooth, white pileus, white spore-print, non-separable pileipellis, somewhat decurrent lamellae, and basidiomata that blacken on bruising, ageing or drying. The dried basidiomata of this species have a very characteristic charred appearance. In the field, basidiomata growing amongst litter in wooded areas, although large, are rather difficult to spot owing to the camouflaging effect caused by the blackened parts.

Acknowledgments

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